

CPTO/BW

08/20/04

CANCEL 1-410

AMEND 411-

478 ←

411. (Currently amended) A method of assessing a state of human heart tissue, comprising:

providing to a computer system a plurality of images of heart tissue, wherein at least one of the images comprises the heart in a substantially expanded condition, and wherein at least one of the images comprises the heart in a substantially contracted condition;

creating a model of at least a portion of ~~an endocardial~~ wall of a left ventricle of the heart, wherein the model comprises the left ventricle in at least an end-systolic state and an end-diastolic state;

assessing a movement of ~~a one or more~~ parts of the ~~endocardial~~-wall model between the end-systolic state and the end-diastolic state; and

comparing the movement to a predetermined standard to assess a state of the heart.

412. (Original) The method of claim 411, wherein the predetermined standard comprises an average of a plurality of normal hearts.

413. (Original) The method of claim 411, further comprising displaying the state of the heart visually within the model.

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414. (Original) The method of claim 411, further comprising displaying the state of the heart visually within the model using a color gradient.

415. (Currently amended) The method of claim 411, further comprising matching a first~~at least one~~ part of the wall of the model in the end-systolic state with a second ~~corresponding~~ part of the wall of the model in the end-diastolic state.

416. (Currently amended) The method of claim 411, further comprising matching a first~~at least one~~ part of the wall of the model in the end-systolic state with a second ~~corresponding~~ part of the wall of the model in the end-diastolic state using one or more normals associated with the ~~first and second~~ parts.

417-421 (Cancelled)

422. (Currently amended) The method of claim 411, further comprising assessing determining a number of parts wherein~~in which~~ the movement of each part is greater than a range from the predetermined standard.

423. (Currently amended) The method of claim 411, further comprising: assessing determining a number of parts wherein~~in which~~ the movement of each part is greater than a range from the predetermined standard; and dividing the number of parts by a total number of parts.

CANCEL 417-421

AMEND 422-

423

422. (Currently amended) The method of claim 411, further comprising assessing determining a number of parts wherein in which the movement of each part is greater than a range from the predetermined standard.

423. (Currently amended) The method of claim 411, further comprising: assessing determining a number of parts wherein in which the movement of each part is greater than a range from the predetermined standard; and
dividing the number of parts by a total number of parts.

CANCEL 424-888

ADD NEW CLAIMS

889. (New) The method of claim 411, wherein the assessed movement comprises movement towards a centerline of the heart.

890. (New) The method of claim 411, wherein the assessed movement comprises wall thickness variation.

891. (New) The method of claim 411, wherein at least one part with assessed movement comprises a point in the wall.

892. (New) The method of claim 411, wherein at least one part with assessed movement comprises a plurality of points in the wall.

893. (New) The method of claim 411, further comprising displaying the state of the heart visually with a plurality of colors, wherein the colors represent kinetic properties of at least one part.

894. (New) The method of claim 411, further comprising displaying the state of the heart visually with a plurality of colors, wherein each of the colors represent different kinetic properties.

895. (New) The method of claim 411, further comprising assessing kinetics of at least a portion of the heart tissue.

896. (New) The method of claim 895, further comprising identifying hyper-kinetic tissue from the assessed kinetics.

897. (New) The method of claim 895, further comprising identifying hyper-kinetic tissue from the assessed kinetics, wherein hyper-kinetic tissue comprises tissue with movement of two or more standard deviations greater than the predetermined standard.

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898. (New) The method of claim 895, further comprising identifying akinetic tissue from the assessed kinetics.

899. (New) The method of claim 898, further comprising assessing tissue suitable for revascularization, wherein tissue suitable for revascularization comprises viable, akinetic tissue.

900. (New) The method of claim 898, further comprising assessing tissue suitable for revascularization, wherein tissue suitable for revascularization comprises viable, akinetic tissue with an akinetic area greater than a predetermined akinetic area.

901. (New) The method of claim 898, further comprising assessing tissue suitable for revascularization, wherein tissue suitable for revascularization comprises viable, akinetic tissue with a non-viable area less than a predetermined non-viable area, wherein the non-viable area is assessed from the plurality of images.

902. (New) The method of claim 898, further comprising assessing tissue suitable for revascularization, wherein tissue suitable for revascularization comprises viable, akinetic tissue with an akinetic area greater than a predetermined akinetic area and akinetic tissue with a non-viable area less than a predetermined non-viable area, wherein the non-viable area is assessed from the plurality of images.

903. (New) The method of claim 895, further comprising identifying akinetic tissue from the assessed kinetics, wherein akinetic tissue comprises tissue with movement of two or more standard deviations less than the predetermined standard.

904. (New) The method of claim 895, further comprising identifying normal tissue from the assessed kinetics.

905. (New) The method of claim 895, further comprising identifying normal tissue from the assessed kinetics, wherein normal tissue comprises tissue with movement that deviates in an amount that is from zero to about two standard deviations from the predetermined standard.

906. (New) The method of claim 895, further comprising identifying diskinetic tissue from the assessed kinetics.

907. (New) The method of claim 895, further comprising identifying diskinetic tissue from the assessed kinetics, wherein diskinetic tissue comprises tissue with movement away from a centerline of the heart.

908. (New) The method of claim 411, wherein the model comprises a three-dimensional model.

909. (New) The method of claim 411, further comprising assessing if a heart is a potential candidate for ventricular reconstruction, wherein the heart is a potential candidate for ventricular reconstruction if the heart comprises at least a predetermined amount of non-viable tissue area, and wherein the non-viable tissue area is assessed from the plurality of images.

910. (New) The method of claim 411, further comprising assessing if a heart is a potential candidate for ventricular reconstruction, wherein the heart is a potential candidate for ventricular reconstruction if the heart comprises at least a predetermined amount of non-viable tissue volume, and wherein the non-viable tissue volume is assessed from the plurality of images.

911. (New) The method of claim 411, further comprising assessing if a heart is a potential candidate for ventricular reconstruction, wherein the heart is a potential candidate for ventricular reconstruction if the heart comprises at least a predetermined amount of non-viable tissue mass, and wherein the non-viable tissue mass is assessed from the plurality of images.

912. (New) The method of claim 411, further comprising assessing if a heart is a potential candidate for ventricular reconstruction, wherein the heart is a potential candidate for ventricular reconstruction if the heart comprises at least a predetermined amount of non-viable tissue and at least a predetermined amount of akinetic tissue.

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913. (New) The method of claim 411, further comprising assessing if a heart is a potential candidate for ventricular reconstruction, wherein the heart is a potential candidate for ventricular reconstruction if the heart comprises at least a predetermined amount of non-viable tissue and at least a predetermined end diastolic volume.

914. (New) The method of claim 411, further comprising assessing if a heart is a potential candidate for ventricular reconstruction, wherein the heart is a potential candidate for ventricular reconstruction if the heart comprises at least a predetermined amount of non-viable tissue and at least a predetermined transmurality. 

915. (New) The method of claim 411, further comprising assessing if a heart is a potential candidate for ventricular reconstruction, wherein the heart is a potential candidate for ventricular reconstruction if the heart comprises an ejection fraction less than a predetermined ejection fraction.

916. (New) The method of claim 411, further comprising assessing if a heart is a potential candidate for ventricular reconstruction, wherein the heart is a potential candidate for ventricular reconstruction if the heart comprises an ejection fraction less than about 35%.

917. (New) The method of claim 411, further comprising assessing if a heart is a potential candidate for mitral valve repair, wherein the heart is a potential candidate for mitral valve repair if the heart comprises at least a selected papillary muscle distance, at least a selected papillary muscle angle, and at least a selected amount of mitral regurgitation.

918. (New) The method of claim 411, further comprising assessing if a heart is a potential candidate for mitral valve repair, wherein the heart is a potential candidate for mitral valve repair if the heart comprises at least a selected papillary muscle distance. 

919. (New) The method of claim 411, further comprising assessing if a heart is a potential candidate for mitral valve repair, wherein the heart is a potential candidate for mitral valve repair if the heart comprises at least a selected papillary muscle angle.

920. (New) The method of claim 411, further comprising assessing if a heart is a potential candidate for mitral valve repair, wherein the heart is a potential candidate for mitral valve repair if the heart comprises at least a selected amount of mitral regurgitation.

921. (New) A method of assessing a state of a heart, comprising:
providing a plurality of images of a heart, wherein the plurality of images are taken over a selected period of time;
dividing the images of the heart into a plurality of regions of the heart, wherein each of the regions corresponds between each of the images;
assessing at least one property of a ventricular boundary in each of the regions of the heart;
comparing each of the assessed properties to a normal range for each region of the heart, wherein the normal range is assessed from one or more healthy hearts;
assigning a region as dysynchronous if an assessed property of the region is outside the normal range for the region; and
assessing a dysynchronous index based on the number of regions assigned as dysynchronous and the number of regions in the normal range.

922. (New) The method of claim 921, wherein the images are provided to a computer system, and wherein the computer system automatically performs one or more parts of the method.

923. (New) The method of claim 921, further comprising creating a model of the heart from one or more of the plurality of images taken at a selected time.

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924. (New) The method of claim 923, further comprising creating a plurality of models of the heart over the selected period of time.

925. (New) The method of claim 924, further comprising using the plurality of models to assess the dysynchronous index.

926. (New) The method of claim 923, wherein the model of the heart comprises a three-dimensional model of the heart.

927. (New) The method of claim 921, wherein each of the regions comprises a point.

928. (New) The method of claim 921, wherein each of the regions comprises a plurality of points.

929. (New) The method of claim 921, wherein the selected period of time comprises a cardiac cycle.

930. (New) The method of claim 921, wherein at least one property of the ventricular boundary comprises a wall thickness of the ventricular boundary.

931. (New) The method of claim 921, wherein at least one property of the ventricular boundary comprises wall motion of the ventricular boundary.

932. (New) The method of claim 931, wherein wall motion comprises torsion.

933. (New) The method of claim 921, wherein the normal range comprises a range within a selected number of standard deviations of a mean for the region.

934. (New) The method of claim 933, wherein the mean for the region is assessed by statistical calculations on a statistically significant number of healthy hearts.

935. (New) The method of claim 921, wherein the normal range comprises a range within about two standard deviations of a mean for the region.

936. (New) The method of claim 921, wherein the dysynchronous index comprises a number of dysynchronous regions divided by a total number of regions in the plurality of regions.

937. (New) The method of claim 921, further comprising assessing if the heart requires intervention based on the dysynchronous index.

938. (New) The method of claim 921, further comprising assessing kinetics of at least a portion of tissue of the heart.

939. (New) The method of claim 938, further comprising identifying hyper-kinetic tissue from the assessed kinetics.

940. (New) The method of claim 938, further comprising identifying hyper-kinetic tissue from the assessed kinetics, wherein hyper-kinetic tissue comprises tissue with movement of two or more standard deviations greater than the predetermined standard.

941. (New) The method of claim 938, further comprising identifying akinetic tissue from the assessed kinetics.

942. (New) The method of claim 938, further comprising identifying akinetic tissue from the assessed kinetics, wherein akinetic tissue comprises tissue with movement of two or more standard deviations less than the predetermined standard.

943. (New) The method of claim 938, further comprising identifying normal tissue from the assessed kinetics.

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944. (New) The method of claim 938, further comprising identifying normal tissue from the assessed kinetics, wherein normal tissue comprises tissue with movement that deviates in an amount that is from zero to about two standard deviations from the predetermined standard.

945. (New) The method of claim 938, further comprising identifying diskinetic tissue from the assessed kinetics. ↳

946. (New) The method of claim 938, further comprising identifying diskinetic tissue from the assessed kinetics, wherein diskinetic tissue comprises tissue with movement away from a centerline of the heart.

947. (New) A system configured to assess a state of a heart, comprising:
a CPU; and
a system memory coupled to the CPU, wherein the system memory stores one or more computer programs executable by the CPU;
wherein one or more computer programs are executable to:
provide a plurality of images of a heart, wherein the plurality of images are taken over a selected period of time;
divide the images of the heart into a plurality of regions of the heart, wherein each of the regions corresponds between each of the images;
assess at least one property of a ventricular boundary in each of the regions of the heart;
compare each of the assessed properties to a normal range for each region of the heart, wherein the normal range is assessed from one or more healthy hearts;

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948. (New) A carrier medium configured to store program instructions, wherein the program instructions are executable to implement a method to assess a state of a heart, comprising:

providing a plurality of images of a heart, wherein the plurality of images are taken over a selected period of time;

dividing the images of the heart into a plurality of regions of the heart, wherein each of the regions corresponds between each of the images;

assessing at least one property of a ventricular boundary in each of the regions of the heart;

comparing each of the assessed properties to a normal range for each region of the heart, wherein the normal range is assessed from one or more healthy hearts;

assigning a region as dysynchronous if an assessed property of the region is outside the normal range for the region; and

assessing a dysynchronous index based on the number of regions assigned as dysynchronous and the number of regions in the normal range.

949. (New) A method of assessing a state of a human heart, comprising:

- providing a plurality of images of a heart, wherein the plurality of images are taken over a selected period of time;
- dividing the images of the heart into a plurality of regions of the heart, wherein each of the regions corresponds between each of the images;
- assessing at least one property of a ventricular boundary in each of the regions of the heart;
- comparing each of the assessed properties to a normal range for each region of the heart, wherein the normal range is assessed for a healthy heart;
- assigning a region as dysynchronous if an assessed property of the region is outside the normal range for the region;
- assessing a ranking of dysynchronous regions based on an amount of deviation from the normal range of each dysynchronous region; and
- providing a template for placement of one or more ventricular pacing leads based on the assessed ranking.

950. (New) The method of claim 949, wherein the images are provided to a computer system, and wherein the computer system automatically performs one or more parts of the method.

951. (New) The method of claim 949, further comprising creating a model of the heart from one or more of the plurality of images taken at a selected time.

952. (New) The method of claim 951, further comprising creating a plurality of models of the heart over the selected period of time.

953. (New) The method of claim 952, further comprising using the plurality of models to assess the ranking of dysynchronous regions.

954. (New) The method of claim 951, wherein the model of the heart comprises a three-dimensional model of the heart.

955. (New) The method of claim 949, wherein each of the regions comprises a point.

956. (New) The method of claim 949, wherein each of the regions comprises a plurality of points.

957. (New) The method of claim 949, wherein the selected period of time comprises a cardiac cycle.

958. (New) The method of claim 949, wherein at least one property of the ventricular boundary comprises a wall thickness of the ventricular boundary.

959. (New) The method of claim 949, wherein at least one property of the ventricular boundary comprises wall motion of the ventricular boundary.

961. (New) The method of claim 949, wherein the normal range comprises a range within a selected number of standard deviations of a mean for the region.
962. (New) The method of claim 961, wherein the mean for the region is assessed by statistical calculations on a statistically significant number of healthy hearts.
963. (New) The method of claim 949, wherein the normal range comprises a range within about two standard deviations of a mean for the region.
964. (New) The method of claim 949, further comprising assessing a dysynchronous index based on the number of regions assigned as dysynchronous and the number of regions in the normal range, wherein the dysynchronous index comprises a number of dysynchronous regions divided by a total number of regions in the plurality of regions.
965. (New) The method of claim 964, further comprising assessing if the heart requires intervention based on the dysynchronous index.
966. (New) The method of claim 949, further comprising assessing kinetics of at least a portion of tissue of the heart.
967. (New) The method of claim 966, further comprising identifying hyper-kinetic tissue from the assessed kinetics.

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968. (New) The method of claim 966, further comprising identifying hyper-kinetic tissue from the assessed kinetics, wherein hyper-kinetic tissue comprises tissue with movement of two or more standard deviations greater than the predetermined standard.

969. (New) The method of claim 966, further comprising identifying akinetic tissue from the assessed kinetics.

968. (New) The method of claim 966, further comprising identifying hyper-kinetic tissue from the assessed kinetics, wherein hyper-kinetic tissue comprises tissue with movement of two or more standard deviations greater than the predetermined standard.

969. (New) The method of claim 966, further comprising identifying akinetic tissue from the assessed kinetics.

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970. (New) The method of claim 966, further comprising identifying akinetic tissue from the assessed kinetics, wherein akinetic tissue comprises tissue with movement of two or more standard deviations less than the predetermined standard.

971. (New) The method of claim 966, further comprising identifying normal tissue from the assessed kinetics.

972. (New) The method of claim 966, further comprising identifying normal tissue from the assessed kinetics, wherein normal tissue comprises tissue with movement that deviates in an amount that is from zero to about two standard deviations from the predetermined standard.

973. (New) The method of claim 966, further comprising identifying diskinetic tissue from the assessed kinetics.

974. (New) The method of claim 966, further comprising identifying diskinetic tissue from the assessed kinetics, wherein diskinetic tissue comprises tissue with movement away from a centerline of the heart.

975. (New) The method of claim 949, further comprising using the provided template to assign positions for placing one or more ventricular pacing leads.

976. (New) The method of claim 949, further comprising placing one or more ventricular pacing leads on the heart based on the provided template.

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provide a plurality of images of a heart, wherein the plurality of images are taken over a selected period of time;

divide the images of the heart into a plurality of regions of the heart, wherein each of the regions corresponds between each of the images;

assess at least one property of a ventricular boundary in each of the regions of the heart;

compare each of the assessed properties to a normal range for each region of the heart, wherein the normal range is assessed for a healthy heart;

assign a region as dysynchronous if an assessed property of the region is outside the normal range for the region;

assess a ranking of dysynchronous regions based on an amount of deviation from the normal range of each dysynchronous region; and

provide a template for placement of one or more ventricular pacing leads based on the assessed ranking.

978. (New) A carrier medium configured to store program instructions, wherein the program instructions are executable to implement a method to assess a state of a heart, comprising:

providing a plurality of images of a heart, wherein the plurality of images are taken over a selected period of time;

dividing the images of the heart into a plurality of regions of the heart, wherein each of the regions corresponds between each of the images;

assessing at least one property of a ventricular boundary in each of the regions of the heart;

comparing each of the assessed properties to a normal range for each region of the heart, wherein the normal range is assessed for a healthy heart;

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comparing each of the assessed properties to a normal range for each region of the heart, wherein the normal range is assessed for a healthy heart;

assigning a region as dysynchronous if an assessed property of the region is outside the normal range for the region;

assessing a ranking of dysynchronous regions based on an amount of deviation from the normal range of each dysynchronous region; and

providing a template for placement of one or more ventricular pacing leads based on the assessed ranking.